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PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

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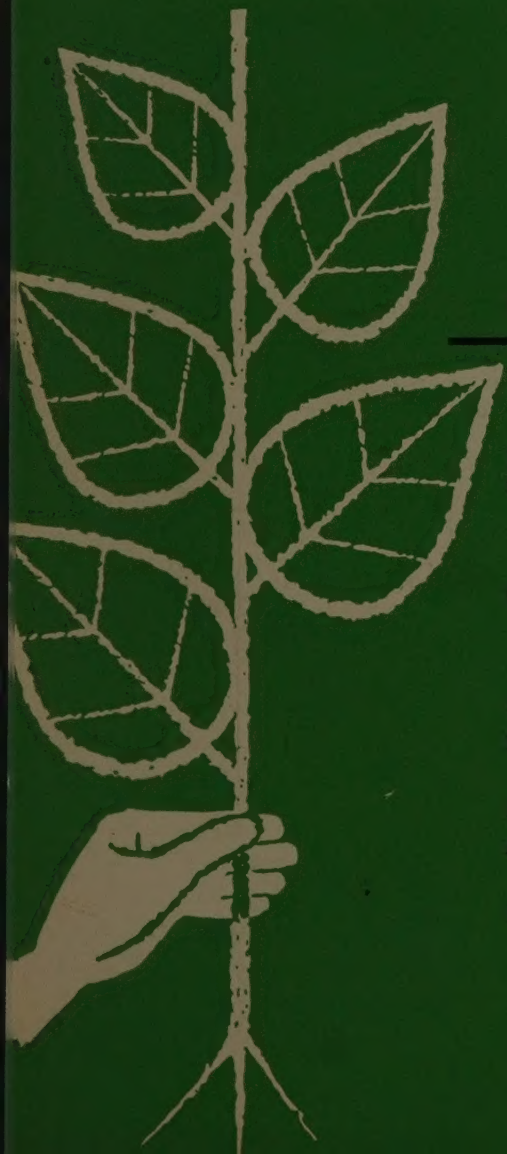

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is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin

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FAO PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

Distribution of Strains of *Phytophthora palmivora* from *Theobroma cacao* in West Africa

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Phytophthora palmivora (Butl.) Butl., the pathogen causing black pod disease and other infections of *Theobroma cacao* L., is of major importance in all established cacao-producing countries. At the West African Cocoa Research Institute, Ghana, a program of breeding and selection of cacao for resistance and tolerance to the disease has been in progress for several years, and a number of selections have given promising results. Whether these selections will remain tolerant under different environmental conditions elsewhere in West Africa is yet to be proven, and they might well be influenced by subjection to attacks by different strains of the fungus. Very little information has been available concerning the nature of *P. palmivora* in this region, and results of a survey of characteristics and distribution of the fungus from the majority of cacao-growing countries there are summarized in this paper.

Isolates from the following countries were examined: Sierra Leone 5, Ivory Coast 7, Ghana 57, Nigeria 47, Southern Cameroon 19, Fernando Po 7, Cameroun 30, Gabon 5, Belgian Congo 1 and Angola 1. Wherever possible, isolates were obtained from pods or infected vegetative material from widely separated localities in each country. Each of the 179 isolates was examined in the characters of development following inoculation into cacao pods, sporangial dimensions and behavior in artificial culture, and crossing tests were also made between isolates from different countries to determine the extent of oospore production. Throughout the tests strict phytosanitary precautions were maintained; no attempt was made to use non-Ghanian isolates in field experiments, and all discarded material was sterilized.

The results showed that distinct strains of *Phytophthora palmivora* occur in West Africa, and that their distribution follows a definite geographical pattern. Isolates of the two more important strains belonged to the "cacao" and "rubber" groups of *P. palmivora* (5) and were sexually complementary. The third small group of isolates was complementary to neither of the other groups and resembled the "atypical" description of the species (3) in many respects. With the exception of two atypical isolates from Sierra Leone, all isolates from countries west of the non-cacao-producing country of Dahomey, i.e., Ghana, Ivory Coast and Sierra Leone, were all of the "cacao" group, and very occasional isolates of this group were found in Nigeria and Southern Cameroon. Isolates from the more easterly countries of Nigeria, Southern Cameroon, Fernando Po and Cameroun were characteristically of the "rubber" group. In addition, isolates from Gabon were from both groups, and the single isolates from Belgian Congo and Angola were of the "cacao" and atypical categories respectively. There were a few cacao-growing countries from which isolates either could not be obtained or were in insufficient quantity. Similarity between isolates from Ivory Coast and Ghana would be expected through the almost continuous cacao belt between the two countries, and for this reason the dominant isolates in Togo and Liberia might be expected to be of the "cacao" group. Similarly, isolates of the "rubber" group may predominate in Rio Muni, Central African Republic and Gabon. Further isolates would be required before the dominant pathogens from Belgian Congo and Angola could be typified. Identification of the isolate from São Thomé would be both valuable and interesting.

The strains differed markedly in all characters examined. Isolates of the " cacao " group developed more rapidly in cacao pods than any others and their growth rate in unripe pods was appreciably greater than in ripe ones; the reverse was frequently the case with other isolates. Pod lesions of the different groups of isolates also had a number of distinguishing characteristics. In sporangial dimensions, the mean spore length of isolates of each group, taken from cacao pods, was approximately equal but the sporangial length:width ratio was an important diagnostic character, the average ratio of " cacao " and atypical isolates being 1.7 and that of " rubber " isolates 1.3. Sporangia of the atypical isolates were invariably distorted to a greater or lesser degree. Distribution of spore length classes also differed between strains. Results of nearly 900 crossing tests for oospore production showed that they were formed in abundance when isolates of the " cacao " and " rubber " groups were grown together. Occasional oospores were also found in mixed cultures of the " rubber " group; this, and the variation found within the group in other characters, indicated that the group was a heterogenous collection of possibly dissimilar isolates.

Apart from consideration of the presence of a variable pathogen in the selection of resistant material, and the additional possibility of a differential response by strains to the fungicides widely used in chemical control of the disease, the occurrence of strains which are sexually complementary raises important questions of plant quarantine. Presence of complementary strains within a territory could give rise to genetic variation, including pathogenetic differences. With the exception of a single isolate from *Mimusops elengi* (4), complementary isolates of *Phytophthora palmivora* have not been found west of Dahomey. Hence, it would seem advisable to prevent, as far as possible, the westerly spread of the " rubber " group isolates, particularly between the two major cacao-producing countries of Ghana and Nigeria. The distance of approximately 150 miles between the easterly limit of the cacao-growing area in Togo across Dahomey to the westerly cacao limit in Nigeria might act as a barrier to natural dispersal.

It is possible that the spread of different strains of the pathogen might be effected through distribution of cacao pods between countries, both inside and outside West Africa. Surface sterilizing techniques in common use would be insufficient to prevent the later development of very small lesions which are easily hidden in mature pods by injuries caused by pests and harvesting. Further spread of the fungus might be reduced by implementation of alternative methods of cacao seed distribution. For small quantities of beans, it has been shown at the West African Cocoa Research Institute[1] that well-washed, peeled and air-dried beans packed in polythene bags survive well. In addition, it has been recommended that " seeds may be moved from any country or area to any other, provided they are extracted from the pods, the pulp removed and packed and treated according to the method described by Dr. Alvim (1) at the Seventh Inter-American Cacao Conference... " (2).

[1] WHARTON, A. L. Unpublished information.

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On "Leaf Curl" of Cotton in the Philippines

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Reyes, Martinez and Chinte (3) reported the discovery in the Philippines of a destructive "leaf curl" disease on cotton. They stated that "preliminary transmission experiments indicate that the virus was transmissible by white flies (*Bemisia gossypiperda*)," and that "the source of infection cannot be explained, but on the affected plants there were white flies (*Bemisia gossypiperda*), the recognized vector of leaf curl of cotton."

Symptoms identical with those described and illustrated by those authors occurred very frequently on many varieties of the two species of cotton commercially grown in the Sudan, Egyptian cotton (*Gossypium barbadense*) and American cotton (*G. hirsutum*), but the causal agent is not a virus. Such symptoms are easily reproduced by exposing the foliage or the roots of healthy cotton plants to a small dose of any of the derivatives of 2,4-D, the selective weed killer. The typical whipping of the lobes, the severe distortion, corrugation and narrowing of the lamina, together with the prominence and yellowing of the veins, are the usual symptoms produced in response to this hormone weed killer.

Staten (5) as early as 1946 warned of the danger to cotton from minute quantities of 2,4-D and indicated that the cotton plant is extremely sensitive to this group of herbicides. Especially when applied as aerial spray, 2,4-D as sodium salt or in the volatile ester form can cause characteristic injuries in cotton fields situated even as far as 20 miles away (1). Cotton plants grown in pots at Shambat showed the typical symptoms caused by 2,4-D (Figure 1), when a small plot of weedy land 300 yards away was sprayed with Fernoxone in August 1959. Similar incidents were reported from the Sudan Gezira, where the same response of cotton occurred as a result of Fernoxone drift from much farther distances.

Cotton is also strikingly sensitive to 2,4-D taken up by the roots, producing again the symptoms similar to those described by Reyes,

Figure 1. Effect of 2,4-D on cotton leaves at Shambat, the Sudan. The upper leaf is normal.

Martinez and Chinte (3). Cotton grown in 2,4-D contaminated soil that had received a normal dose of this spray one or even two years earlier may often produce 2,4-D symptoms. Such incidents were noted both on plants

Figure 2. Effect of cotton leaf curl virus on leaves of the Egyptian cotton variety BAR 14/25 at Shambat, the Sudan. Note leaf enations and thickening of small veins on infected leaves, the upper leaf being healthy.

potted in contaminated soil and on plants grown on a field previously sprayed with 2,4-D.

The effect of 2,4-D was earlier described and illustrated by Dunlap (1) in the United States and by Lawes (2) in Nigeria and in both cases the symptoms appear identical with those described and illustrated by Reyes, Martinez and Chinte (3). It seems most unlikely therefore that the symptoms on cotton described from the Philippines are caused by a virus but they could be a reaction to the uptake of an extremely minute dose of the hormone weed killer, either as a result of air drift from adjacent or distant fields or the absorption of 2,4-D from the contaminated soil.

Reyes, Martinez and Chinte (3) have chosen the name "leaf curl" for the abnormality found in the Philippines. Even if this abnormality was caused by a virus transmitted by *Bemisia gossypiperda* (= *B. tabaci*), as they claimed, the use of the name "leaf curl" should be avoided. Leaf curl virus of cotton, which is transmitted by white fly, *B. tabaci*, produces symptoms (Figure 2) on both Egyptian cotton and American cotton totally different from those described from the Philippines. Owing to the confusion that will undoubtedly arise, regardless of what is the cause of the disorder of cotton in the Philippines, it is proposed here that the name "leaf curl" should not be applied to any disease or disorder other than the one found on cotton in the Sudan and Nigeria as described in the standard work by Smith (4), Tarr (6) and others.

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OUTBREAKS AND NEW RECORDS

DOMINICAN REPUBLIC

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Rice as a new host of *Spermospora subulata*

On rice plants of the local variety Fidelia grown as a dry land crop near Monte Plata, Province Trujillo, Dominican Republic, the writer observed in 1958 a serious and widespread leaf-scalding. Microscopic examination of the lesions revealed a very extensive infection of *Spermospora subulata* (Sprague) Sprague[1] as well as the presence of *Helminthosporium oryzae* v. Breda de Haan, the conidial stage of *Cochliobolus miyabeanus* (Ito and Kuribay) Drechsler.

The lesions caused by the two fungi were intermixed. With some difficulty and by careful examination it was possible to distinguish the very numerous spots due to *Spermospora subulata* from those caused by *Helminthosporium oryzae*. In contrast with the spots caused by *H. oryzae*, the lesions due to *S. subulata* have a more uniform brown or yellow-brown color, are more elongated in shape and usually not limited by leaf veins. In severe cases, they cause a light brown to amber blighting of the leaves.

On such lesions, especially on the upper side of the leaf, hyaline or occasionally light yellowish fuliginous conidia of *Spermospora subulata* were found in large numbers. The conidia are subulate in shape, 1-2-septate, rarely 3-septate, with distal cell tapering into an attenuated, straight or slightly curved, whip-like terminal. At the basal end of the conidium, a rather prominent hilum often exists. The ellipsoid body of the conidium measures 14-29 × 2.6-4.2 μ mostly 17-19 × 3 μ, and the whip-like terminal is about the same length as the ellipsoid body. The septa appear to be formed immediately before germination of the conidium, which takes place by the formation of lateral germ tubes. Conidia are borne on short, hyaline conidiophores less than 20μ in width. Vegetative mycelium, hyaline or chlorinous in color, is deeply seated in the parenchyma tissue of the leaf, where it is often aggregated to form small stromatic masses on which conidiophores are produced.

The characteristic shape of the conidia permits the identification of the fungus without difficulty. This fungus has hitherto been recorded only on some grasses in the western part of the United States. The present finding therefore extends its geographic distribution to a tropical country and its host range to a crop of great economic importance.

Spermospora subulata produced a large number of spots on rice leaves and its simultaneous attack with *Helmithosporium oryzae* caused much more severe damage than *H. oryzae* alone in neighboring areas. In view of this and its known pathogenicity on some forage grasses,[2] it may be assumed that, at least under certain conditions, *S. subulata* can become a dangerous disease of rice.

Should *Spermospora subulata* find in tropical areas many hosts among wild grasses, as in the western United States, the measures commonly used for controlling rice diseases, such as seed treatment and destruction of crop residues in the field, would not be effective against this new disease. If the disease spreads further and becomes more prevalent, the development of resistant varieties and field application of fungicides would have to be undertaken, although the latter measure would involve serious economic considerations in most rice-growing countries in the tropics.

[1] SPRAGUE, R. 1948. Some leaf spot fungi on western Gramineae. - II. *Mycologia* 40: 177-193.

[2] SPRAGUE, R. 1950. *Diseases of cereals and grasses in North America*. Ronald Press Co., New York.

INDIA

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Record of woolly apple aphid in Sikkim

The woolly apple aphid, *Eriosoma lanigerum* (Hausman), has found its way into several countries where apple cultivation has been introduced. It has been found in practically all the apple-growing areas in India but the damage that it causes to apples trees in Sikkim is little known.

During a recent visit to Lachung, Sikkim, an apple-growing area at an altitude of about 9,000 feet, the author found a serious infestation of the woolly apple aphid. It was learned from the growers that in certain years the crop was extremely poor as a result of the attack of the pest, and that chemical methods of control proved futile. Moreover, when chemical sprays were used, the pest attack was reduced for a short time but appeared again later with renewed vigor, causing more damage. An examination of the trees showed the presence of the predacious Coccinellid, *Exochomus uropygialis* Muls., feeding on the pest. The use of chemicals apparently killed the predators and, as a result, the pest increased. The woolly apple aphid was not found attacked by any parasite.

The Dewan of Sikkim, Mr. B. Prasad, I.A.S., has asked the Indian Station of the Commonwealth Institute of Biological Control for assistance in the control of the woolly apple aphid by biological means, since it has been proposed to extend the area under apple at Lachung and further spread of the pest would increase losses. It is proposed to introduce the well-known parasite *Aphelinus mali* (Hald) to control the pest.

NICARAGUA

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Occurrence of Mediterranean fruit fly

During the course of routine examination of McPhail liquid lure traps currently in use throughout Nicaragua for the purpose of determining the presence or absence of the Mediterranean fruit fly (*Ceratitis capitata* [Weid.]), Sr. Francisco A. Estrada R., Chief of the Nicaraguan Entomology Department, while accompanied by Sr. Alvaro Sequeira, collected four specimens of Tephritidae which were all identified as *C. capitata*. The specimens were collected in two traps suspended in rose-apple (*Eugenia jambos*) trees bordering coffee, on Finca El Carmen, which is located along the Pan American Highway about 36 kilometers from Managua. The identity of these insects was verified by the writer.

Although the Mediterranean fruit fly had been intercepted during April 1959 along the Nicaraguan-Costa Rican frontier at both El Castillo and Isla Grande, Nicaragua,[1] this is the first record of this species being intercepted deep within Nicaraguan territory and in the heart of the coffee and citrus area.

In order to tentatively determine the extent of the infested area, on 21 January 1960, the writer, in company with Sr. Estrada and two of his assistants, visited the area where the flies had previously been trapped. Review of the traps revealed an additional 15 specimens of the Mediterranean fruit fly in six of the traps, three of which were located from 34 to 36

[1] BERG, G. H. 1959, Nicaragua - Discovery of Mediterranean fruit fly. *FAO Plant Prot. Bull.* 7: 101-102.

kilometers along the Pan American Highway, while the other three along the highway between Diriamba and San Marcos. The following day, additional specimens were collected in traps located along the highway between San Marcos and Jinotepe.

Since it was not possible to determine the extent of the Mediterranean fruit fly with only about 100 McPhail traps placed within an area of more than 100 square kilometers and since it appeared that the infested area might be greater than originally anticipated, additional 2,000 traps were placed throughout the entire suspected area at the rate of about 25 traps per square kilometer. A review of these newly placed traps about one week later produced 1,632 adult Mediterranean fruit fly specimens, which were encountered in 223 traps located from 32 to 41 kilometers along the Pan American Highway and to a depth of about 5 kilometers on either side of the highway. This represented an infested area of roughly 100 square kilometers or about 10,000 hectares.

The town of Diriamba, which is located 39 kilometers from Managua along the Pan American Highway, is almost in the center of the infested area. The area around Diriamba and the nearby towns of Jinotepe and Masaya is the most important coffee-producing area in Nicaragua, as well as being one of the most important citrus-producing centers. In addition, mango (*Mangifera indica*), rose-apple, star-apple (*Chrysophyllum cainito*) and other tropical fruit trees are numerous. It would be difficult to find an area in Nicaragua better suited for the Mediterranean fruit fly to establish itself than here. In this area, fence rows of rose-apple border coffee, and several excellent citrus fincas are well established. During December and January there is an abundance of ripe coffee berries, followed in February and March by ripe citrus.

How the Mediterranean fruit fly reached this coffee and citrus center is difficult to determine, since this area is approximately 100 kilometers from the Costa Rican border and there is a strong, prevailing east-west wind. In addition, a review of traps placed along the Pan American Highway between Jinotepe and Peñas Blancas at the Nicaraguan-Costa Rican frontier failed to reveal the presence of the Mediterranean fruit fly. Nicaragua also furnishes well-organized plant quarantine services at Peñas Blancas, which prevents the entry of prohibited plant products at this point. Although it may never be certain as to how this pest was introduced into Nicaragua, its establishment here has brought the Mediterranean fruit fly closer to the other Central American countries, Mexico and the United States.

PLANT QUARANTINE ANNOUNCEMENTS

ARGENTINA

Decree No. 13501 of 27 October 1959, published in the *Diario Oficial* Vol. 67 No. 19085 of 13 November 1959, prohibits the importation of pollen of plants of the family Rosaceae by any means of transport. This measure has been taken to prevent the introduction of dangerous bacterial and virus diseases and other diseases which may be carried by pollen.

INDIA

Notification No. 6-10/57-PPS of 18 January 1960 amends Notification No. 320/35-A of 20 July 1936 with regard to the importation of potatoes. The new notification prohibits the importation of potato plants including tubers, except potato tubers imported for research and experimentation by a governmental scientific institution, through the seaports of Bombay, Calcutta, Cochin, Madras or Visakhapatnam and the airports of Santa Cruz (Bombay), Dum Dum (Calcutta), Meenambakam (Madras) or Palam-Safdarjung (New Delhi), under the following conditions :

1. Each consignment must be covered by an import permit which may be obtained from the Plant Protection Adviser upon application.

2. Each consignment must be accompanied by a consignor's statement stating the country and district of origin of the potatoes and an official certificate attesting :

(*a*) that the potatoes were grown in an area free from wart disease (*Synchytrium endobioticum*), bacterial ring rot (*Corynebacterium sepedonicum*), golden nematode (*Heterodera rostochiensis*) and Colorado beetle (*Leptinotarsa decemlineata*) ; that ring rot and Colorado beetle did not occur during the 12 months immediately preceding harvest ; and that wart disease and golden nematode never occurred within 8 kilometers of the field of cultivation ;

(*b*) that the tubers in the consignment are free from any of the pests and diseases mentioned above or that they do not occur in the country of origin ;

(*c*) that the crop was inspected in the field at least 15 days before harvest and found to be healthy and free from virus diseases ;

(*d*) that the tubers were examined immediately prior to export and found to be free from pests, diseases and soil ;

(*e*) that the tubers were contained in new, clean and unused packings.

3. The quantity of tubers imported at any one time may not exceed 50 kilograms.

4. The consignments are subject to inspection and treatment on arrival and post-entry quarantine.

NETHERLANDS NEW GUINEA

Plant Quarantine Ordinance of 30 June 1959, published in the *Netherlands New Guinea Government Gazette* No. 27, 1959, constitutes the basic legislation governing the importation of live plant material for the purpose of preventing the introduction of crop pests and diseases and establishes the powers of the Director of the Department of Economic Affairs in this connection. It came into force on 1 January 1960 and revokes the Ordinance of 27 September 1926 as amended by the Ordinance of 14 October 1932. For the purpose of the ordinance "live plant material" is meant to include live plants, parts or pieces thereof, such as seeds, fresh fruit, flowers, cuttings, rooted cuttings, budwood, grafts, bulbs, tubers, rhizomes, etc.

Decree No. Ez/59-98 of 17 October 1959, issued by the Director of Economic Affairs, as

amended by Decrees No. Ez 59-121 of 27 November 1959 and No. Ez 60-9 of 5 January 1960, contains the Executive Regulations Plant Quarantine Ordinance. In these regulations, the Southeast Asia and Pacific region and the American tropics are defined as in the Plant Protection Agreement for the Southeast Asia and Pacific region. The main provisions are as follows :

Imports prohibited

1. Live plant material of all species of the family Sterculiaceae (except cacao) and the family Bombacaceae, originating from a country where cacao diseases caused by the swollen shoot virus complex occur.

2. Live plant material (except plant material of the genus *Hevea*) originating from the American tropics or any other country where the South American leaf blight (*Dothidella ulei*) occurs.

Imports restricted

Importation of the plant materials mentioned below, except seed potatoes, may be made only for scientific purposes. Each shipment of the materials mentioned below must be covered by a written permit issued by the Head of the Division of Agriculture and Stock, specifying requirements for the importation. The shipment must be addressed to, and received by, the head of the division or a person appointed by him.

The materials mentioned below may be imported only through Hollandia. Each shipment must be accompanied by a phytosanitary certificate.

In addition, specific requirements indicated under each plant material must be fulfilled.

1. Hevea rubber. Plant material of the genus *Hevea* from outside the Southeast Asia and Pacific region must be disinfected and freed of any original soil in the country of origin and must be accompanied or covered by a phytosanitary certificate.

Plant material capable of further growth or propagation (except seed) from the American tropics or any other country where South American leaf blight (*Dothidella ulei*) occurs, must, in addition to the measures mentioned above, be grown for a prescribed period at an intermediate plant quarantine station, and a certificate to this effect must be submitted.

Seeds from the American tropics or any other country where South American leaf blight occurs, must be inspected and again disinfected at an approved intermediate place and repacked in unused containers and packing material. A certificate to this effect must be submitted.

Plant material not capable of further growth or propagation requires proof that it was satisfactorily sterilized in the country of origin.

Plant material intended for growth or propagation from outside the Southeast Asia and Pacific region must, in addition to measures mentioned above, be grown under post-entry quarantine.

2. Cacao. Live plant material of the genus *Theobroma* must be accompanied by a certificate issued by an authorized officer of the country of origin or the country where the plants were quarantined, stating that the material does not originate from a country where diseases caused by swollen shoot virus complex or cushion gall occurs and that the plants were quarantined for a satisfactory period at a place where the two diseases do not occur.

3. Sweet potato. Only seed of *Ipomea batatas* may be imported.

4. Coffee. Only seed of the genus *Coffea*, which has been satisfactorily disinfected, or live plant material which has been grown for a satisfactory period under quarantine may be imported.

5. Citrus. Live plant material of the genus *Citrus* must be accompanied or covered by a certificate issued by an authorized officer of the country of origin, attesting that the material is free from virus diseases.

6. Seed potatoes. Seed potatoes may be imported only if they were grown in the Netherlands, Australia or the Territory of Papua and New Guinea.

7. Unhusked rice and seed of the genus *Oryza*.

8. Live plant material of banana (*Musa*), sugar cane (*Saccharum*), coconut palm (*Cocus*), taro (*Alocasia, Colocasia, Xanthosoma, Cyrtosperma* and *Amorphophallus*).

Imports unrestricted

The provisions of the ordinance will not apply to live plant materials of soya beans, Katjang hidjan (*Phaseolus radiatus*), chestnuts, sulasi (*Ocimum basilicum*), nuts, cumin, intended only for use as food.

General provisions

PORTS OF ENTRY

Plant materials listed under "Imports restricted" may be imported only through Hollandia. All other live plant materials may be imported through Hollandia, Biak, Manokwari, Sorong, Fak-Fak and Merauke.

CERTIFICATION AND INSPECTION

All live plant materials which may be imported only through designated ports of entry should be accompanied by a phytosanitary certificate issued and signed by the appropriate authorities of the country of origin and including a statement that the material was found free from animal and vegetable pests of crops. Such plant materials should be inspected on arrival.

EXCEPTIONS

In special cases, the Director of Economic Affairs may permit the importation of live plant materials, even though the requirements of the regulations are not fulfilled.

NEWS AND NOTES

INTER-AMERICAN CACAO CONFERENCE

The Eighth Inter-American Cacao Conference will be held under the auspices of the Government of Trinidad and Tobago, in Port-of-Spain, Trinidad, 15-25 June 1960. It will be organized in co-operation with the Inter-American Cacao Center of the Inter-American Institute of Agricultural Sciences.

As on previous occasions, the Conference will provide an opportunity for those interested in cacao to exchange information and experience on all aspects of cacao research and cultivation. In addition to selected papers of wide interest, technical papers will be presented and discussed at sessions to be held simultaneously for various subjects. Problems concerning cacao diseases and pests will constitute one of the major topics of discussion. A seminar on cacao breeding and selection will be held immediately preceding the Conference and will cover cacao breeding for disease resistance.

Enquiries concerning the Conference should be addressed to: Gordon Havord, Secretary General, Inter-American Cacao Conference, Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica.

FAO MEETING ON RICE PRODUCTION AND PROTECTION

The Working Party on Rice Production and Protection established by the International Rice Commission met in Peradeniya, Ceylon, 14-19 December 1959. It was attended by representatives of the Dominican Republic, France, India, Iran, Italy, Japan, Federation of Malaya, Pakistan, the Philippines, Thailand, United Kingdom, United States and Viet-Nam, and by observers of the Rockefeller Foundation and the Commonwealth Institute of Biological Control. The following were the main topics of discussion concerning rice protection:

Following the work initiated by the former Working Party on Rice Breeding, research on physiological diseases of rice is to be promoted on a co-operative basis and Dr. J. Takakashi of Japan is to continue to act as co-ordinator for this activity.

Recognizing the need for more information on the distribution and prevalence of rice pests and diseases, governments were invited to make careful surveys in their respective territories and to prepare lists of rice pests and diseases for circulation through FAO to all participating countries. Much attention was given to the evaluation of losses caused by pests and diseases and the difficulties involved in securing accurate information in this regard. Uniform field techniques for evaluating insect losses were suggested and participating governments were urged to adopt such techniques so that results obtained could be more readily compared.

In order to provide a basis for the establishment of methods for forecasting outbreaks, it was recommended that investigations on ecological factors affecting the development of major pests and diseases be intensified. FAO was requested to serve as a clearinghouse for information on methods in current use for forecasting outbreaks.

The progress in biological control of rice pests was reviewed and FAO was requested to provide assistance to facilitate the exchange of parasites, predators and pathogens under adequate supervision. It was also suggested that governments should amend quarantine regulations to facilitate rapid exchange.

The development of rice varieties resistant to insect attacks and diseases was discussed in detail. It was recommended that uniform blast nurseries be established in as many countries as possible, and a committee was appointed to formulate plans and directions for the establishment and operation of such nurseries.

In view of the scarcity of information available on nematodes affecting rice, FAO was requested to investigate the possibility of developing a co-operative program for a survey of nematodes in rice fields.

INTERNATIONAL MEETING ON ORGANIZATION AND METHODS OF PLANT PROTECTION

An International Meeting on Organization and Methods of Plant Protection, which is being organized under the auspices of the Netherlands Ministry of Agriculture and Fisheries by the International Agricultural Center of the Netherlands, will take place at Wageningen, 1-26 August 1960. In the Netherlands it has been felt that international congresses concerning plant protection usually deal only with research findings, and the agricultural and operational aspects of plant protection have not been given adequate consideration. In order to facilitate the exchange of views on organizational problems and practical experiences on methods, the meeting is being convened to promote international co-operation and mutual understanding in these aspects and will cover the following subjects :

Organization of research on plant protection.
Organization and problems of plant protection advisory services.
Warning systems and services and their relative importance in advisory work.
Plant protection laws and regulations.
Organization and operation of inspection services for agricultural and horticultural crops.
Organization of the inspection of agricultural and horticultural export products.
Seed inspection and certification.
Organization and operation ot approval schemes for pesticides.
Spraying and dusting techniques.
Agricultural aviation and its possibilities for plant protection.
The possibilities and advantages of combined biological and chemical control of insect pests.
Breeding and distribution of resistant varieties of crops.

The discussions of most subjects will be supplemented by demonstrations, and field trips will be arranged to see plant protection activities in the Netherlands. Persons planning to partcipate in the meeting are invited to communicate with : The Director, International Agricultural Center, 1 Generaal Foukelsweg, Wageningen, the Netherlands.

STABILIMENTO TIPOGRAFICO FAUSTO FAILLI — ROMA

IRRIGATION BY SPRINKLING

FAO Agricultural Development Paper No. 65

The above publication is one of an intended series designed to aid in affecting better use and control of irrigation water on the land. It accomplishes the dual purpose of providing information and serving as a textbook.

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